

Cooking For Engineers

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Kitchen Notes: Wheat Flour

There are several kinds of wheat flour available for sale with the most popular being enriched and bleached all-purpose flour. The differences between the flours comes down to the type of wheat, the parts of wheat included, the processing of the wheat, and any additives added to the flour. In this article, I'll examine each of these characteristics:

Protein content

A certain type of protein called gluten (glutenin) is responsible for wheat flour's elastic properties. The more gluten in a flour makes it easier for the flour to build up a tough structure able to trap the waste gases of yeast during kneading as well as rise effectively during baking. Less gluten in a flour produces a lighter, less chewier texture such as those found in cakes. The exact amount of gluten in your flour depends on where it was milled and the variations in growth of the wheat crop.

The main wheat varieties grown in the United States are, in order of quantity grown and sold, hard red wheat, soft red wheat, durum and white. Hard red wheat is used to produce flour high in gluten content, while soft red wheat is used for flour low in gluten. Durum is milled to produce semolina flour used mainly for macaroni pastas. Semolina flour has the highest gluten content of all mass produced wheat flours. White wheat is produced in smaller quantities in the U.S. and makes low gluten flour.

High gluten flour and *bread flour* is produced from hard wheat. High gluten flour has a gluten percentage of about 12-14% while bread flour contains about 10-13% gluten. Both flours are almost completely made of hard wheat, but some high gluten flours are treated to reduce starch content, raising the gluten content to around 14%. These flours are generally used for making breads. High gluten flour is reserved for breads that are extra elastic such as bagels and pizza.

half cup in milliliters

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Cake flour is produced from soft wheat and is low in gluten content (8-10%). This flour is used for making delicate cakes. Baked goods made with cake flour has a tendency to crumble because of the low gluten content.

All purpose flour is made from a mixture of hard and soft wheats. The gluten content ranges from 9-12%. This is the most versatile flour because it can be used to make both cakes and breads. However, breads won't be as chewy and cakes won't be as tender as if you used bread or cake flour.

Pastry flour is also a mix of hard and soft wheat flours with an emphasis on soft. Generally, the gluten content is 9-10% and is often recommended for pie crusts.

Germ

Whole wheat flour contains the germ (the embryo of the wheat kernel) and is more flavorful than regular all-purpose flour which does not include the germ. Because the germ is included, there are more nutrients as well as fiber and fat content in whole wheat flour. However, the flour should be stored in the refrigerator to prevent the germ oils from becoming rancid.

Processing

Almost all the flour sold is *steel ground* meaning a large machine with steel hammers or rollers crushes and grinds the wheat kernels down. This is a very efficient means of producing flour, but the steel surfaces heat up with the high speed and volume of wheat being ground. This heat causes some of the vitamins in steel ground flour to be destroyed during the grinding process.

Alternatively, *stone ground* flour is produced by the relatively slow grinding of large stones together (with the wheat in the middle). This type of flour is harder to find and almost always leaves the germ intact producing whole wheat flour. There is no heat build up, so all the nutrients stay intact as the flour is made.

Bleaching or aging is another process that differentiates flours.

Bleached flours produce doughs that are less sticky and rise better than unbleached flours. Bleaching can be accomplished by aging the flour over time (the oxidation of the flour causes the yellow pigments to fade) or through a chemical means (usually using chlorine dioxide and potassium bromate to age the flour). The aging process removes some of the naturally occurring vitamin E present in wheat. The flour

ends up uniformly white and has (generally) better baking properties.

The texture of the flour is determined by how much sifting (or bolting) is performed at the mill. The degree of sifting will result in a powdery flour or a coarse flour. Prior to packaging, most flours in the United States are also presifted. *Presifted flour* can be measured directly from the bag by stirring, measuring with a dry measuring cup, and leveled with a straight edge. *Unsifted flour* needs to be sifted prior to measuring (by volume). If unsifted flour is measured by weight, it should still be sifted prior to use in a recipe requiring sifted flour (assume all recipes require sifted flour).

Additives

Enriched flour contain vitamins and nutrients that have been added to offset the loss from the grinding and aging of flour. Usually, niacin, riboflavin, thiamin and iron are added to flours that do not contain wheat germ. In addition vitamin E is often added to bleached wheat. Some brands will also contain additional vitamin A, C, and D.

Some bread flours will have a little bit of malted barley flour added to help yeast growth. In addition, potassium bromate may be included to lend strength and help the dough maintain the yeast gases.

The addition of baking powder and salt produces *self-rising flour* or *leavened flour*. When using self-rising flour, simply omit the baking powder and salt from the recipe (leave in any baking soda a recipe calls for).

Other names?

Outside of the United States, different types of flour may have different names. For example, *plain flour* is often similar to all purpose flour. However, the regional differences that cause all-purpose flours to vary from U.S. state to state, also cause similar flours from other nations to differ slightly in property from those in the United States.

posted by Michael Chu @ 10/20/2004 06:45:00 PM

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